

REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended each of the independent claims 9, 30 and 67 to recite that the web or fabric is self-supporting. In addition, Applicants have incorporated the subject matter of claim 29 into each of claims 9, 30 and 67; and, correspondingly, have cancelled claim 29 without prejudice or disclaimer. Moreover, Applicants have amended claim 82 to recite that the fiber-containing material is made by a process consisting essentially of the recited steps set forth in claim 67.

Initially, it is respectfully requested that the present amendments be entered. Noting, for example, the new references applied by the Examiner in the Office Action mailed April 12, 2004, it is respectfully submitted that the present amendments do not raise any new issues, including any issue of new matter, the present amendments incorporating subject matter of dependent claims into independent claims and clarifying the nature of the web or fabric in light of the rejection under the second paragraph of 35 USC §112 in the Office Action mailed April 12, 2004. In addition, it is respectfully submitted that the present amendments materially limit issues remaining in connection with the above-identified application, both with respect to claim rejections under the second paragraph of 35 USC §112 and with respect to the prior art rejections. In this regard, noting that claim 29 was not rejected over the teachings of Harrington, et al. and Tortora, in the Final rejection of April 12, 2004, clearly the incorporation of the subject matter of claim 29 into each of claims 9, 30 and 67, the sole independent claims being considered on the merits herein, materially limits issues herein. Moreover, noting the new grounds of rejection

set forth in the Office Action mailed April 12, 2004, it is respectfully submitted that the present amendments are clearly timely.

In view of the foregoing, it is respectfully submitted that Applicants have made the necessary showing under 37 CFR § 1.116(c); and that, accordingly, entry of the present amendments is clearly proper.

Applicants respectfully traverse the rejection of their claims under the second paragraph of 35 USC §112, particularly insofar as this rejection is applicable to the claims as presently amended. Thus, it is respectfully submitted that in view of present amendments, it is clear that the claimed material is a web or fabric "that is self-supporting". Thus, as presently amended, it is clear that the present claims are directed to a material that is a web or fabric that can form a stable web or fabric layer by itself without needing additional layers to provide reinforcement or support to the fabric layer (that is, is "self-supporting").

It is respectfully submitted that the rejection of claim 82 as being indefinite is moot, in light of present amendments thereto. Thus, claim 82 has been amended to recite that the material is made by a process "consisting essentially of" said steps (that is, the steps expressly set forth in claim 67). Thus, as presently amended, it is respectfully submitted that claim 82 is clear with respect to the fabric being made by specified processing.

The statement by the Examiner in Item 6 on page 3 of the Office Action mailed April 12, 2004, that the use of multi-component fibers as opposed to a mixture of mono-component fibers, "would be a process limitation which is not given any patentable weight at this time since [applicants are] claiming the product produced by the process and not the process itself", is noted. However, where the processing

provides a different product, such processing must be taken into account in determining patentability of the product formed. See In re Luck, 177 USPQ 523, 525 (CCPA 1973). It is respectfully submitted that the processing according to the present invention, including the use of the multi-component fibers, provides more intimate and better mixing of the fibers, providing a product having improved strength and softness. In particular, as described in the paragraph bridging pages 8 and 9 of Applicants' specification, improved fabric strength and softness result from improved distribution and finer divisions of both load-bearing fiber segments (the non-melting component) and the melted segments. The smaller load-bearing fibers have lower bending moments than conventional, larger fibers, so the fabric is softer; and the smaller fibers are also higher in number for a given fabric weight, so that there are more points at which the load-bearing fibers cross each other. In addition, because the fiber-containing material according to the present invention places smaller amounts of adhesive at more bonding sites, and because there are more bonding sites formed, the resulting fibrous material can be made stronger and can be made softer, and can have a more complete appearance. Moreover, through use of the splitable segmented fibers with segments of different melt temperatures, the binder fibers (micro-denier binder fibers of the split lower melt temperature material) are evenly and thoroughly dispersed in the web, and thermal bonding with the web can easily be effected by melting and solidifying the binder fibers.

Again, it is emphasized that according to the present invention the processing, including the multi-component fibers used and processing thereof, provides a product different from (and better than) products formed by other, conventional

techniques, such that the processing must be given weight in determining patentability of the presently claimed material.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed April 12, 2004, that is, the teachings of the U.S. patents to Harrington, et al., No. 3,229,008, and to Marshall, No. 4,083,913, and the publication by Tortora, Understanding Textiles (1992), pages 40, 188, 196 and 216, under the provisions of 35 USC §103.

Initially, Applicants note with thanks allowance of claim 81, in the Office Action mailed April 12, 2004.

As for the remaining claims, it is respectfully submitted that the teachings of the applied references do not disclose, nor would have suggested, fiber-containing material as in the present claims, made from a plurality of multi-component fibers, with each of the multi-component fibers including at least first and second segments, the first segments of the plurality of multi-component fibers having cross-over points with each other, where the first segments cross each other, the second polymer material, of the second segments, having been melted and being substantially only at the cross-over points where the first segments cross each other, to act as a binder of the material, wherein the multi-component fibers have a size of at most 1 denier per fiber, the fiber-containing material is a web or fabric that is self-supporting, and the materials of the multi-component fibers are selected from groups of materials as in the present claims. See claim 30.

In addition, it is respectfully submitted that the applied references would have neither taught nor would have suggested such fiber-containing material including multi-component fibers having at least the first and second segments, the second segments having been melted and being a binder of the fiber-containing material, with the first and second segments having been at least partially split from each other prior to melting of the second segments, the fiber-containing material having cross-over points of the first segments with each other, with the second polymer material, of the second segments, being substantially only at the cross-over points where the first segments cross each other, the multi-component fibers having a size of at most 1 denier per fiber (dpf), and wherein the fiber-containing material is a web or fabric that is self-supporting and the first and second segments are made of first and second polymer materials, respectively, as in the present claims. See claim 9.

Furthermore, it is respectfully submitted that the reference as applied by the Examiner would have neither taught nor would have suggested such fiber-containing material as in the present claims, made by the process including collecting a plurality of multi-component fibers having first and second segments, the multi-component fibers having a size of at most 1 denier per fiber (dpf), splitting the second segments at least partially from the first segments, and, after the splitting, thermally bonding the first segments by melting the second polymer material of the second segments, the second polymer material of the second segments being melted so as encapsulate the first segments (of first polymer material) at cross-over points of the first segments, with the first segments crossing each other at the cross-over points, and wherein after the thermal bonding the second polymer material of the second segments is substantially only at the cross-over points of the first segments where

the first segments cross each other, the fiber-containing material being a web or fabric that is self-supporting, and the first and second segments being made of materials as set forth in the present claims. Note claim 67.

Moreover, it is respectfully submitted that the applied references would have neither taught nor would have suggested the additional features of the present invention as in the dependent claims being considered on the merits in the above-identified application, including (but not limited to) wherein the post-split fibers (the resulting product after at least partially splitting - see claim 79, or completely splitting - see claim 80, the first and second segments from each other) have dpf values less than that of the multi-component fibers and as low as 0.01 dpf; and/or wherein the multi-component fibers are microfibers (see claim 15); and/or weight of the formed material (note claim 12); and/or wherein the second segments have been completely melted in forming the material (note, for example, claim 13); and/or wherein the second polymer material forming the second segments is the sole binder of the fiber-containing material (note claim 14); and/or wherein the second segments have been completely split from the first segments (see claim 20), or have been only partially split from the first segments (see claim 18); and/or wherein the fiber-containing material is formed by a procedure consisting essentially of the processing steps expressly recited in claim 67 (see claim 82).

The invention, as being considered on the merits in the present application, is directed to fiber-containing materials (for example, fibrous materials, such as woven fabrics, knit fabrics, yarns, webs and nonwoven fabrics). It has long been desired to provide bonded fibrous materials, including nonwoven materials, having increased strength and increased softness. According to various techniques for forming such

bonded fibrous materials, a binder fiber is utilized having an adhesive sheath, which is softened so as to bind fibers thereto after the softened adhesive has hardened. Note, for example, page 1, line 19 to page 2, line 14, of Applicants' specification. In this structure, there is excessive adhesive, and there is undesirable bonding of more than just the cross-over points (that is, potential bonding sites) of the structure.

It has also been known to use standard size binder fibers which are melted, forming melted adhesive, to provide the bonded structure. However, an excessive amount of binder at one spot occurs, as described in the paragraph bridging pages 2 and 3 of Applicants' specification.

Fiber structures composed wholly or in part of completely or partially split multi-component fibers are known, and it was known to bond the fibers at the points of intersection through application of heat. Note the last full paragraph on page 3, and the paragraph bridging pages 3 and 4, of the present specification.

However, in prior techniques, with improved (increased) strength there occurred decreased softness, and with increased softness there occurred decreased strength. Thus, it was still desired to provide fibrous material having both improved strength and softness, with less wasted binder material.

It has also been desired to provide fiber-containing material having a higher surface area and smaller pore size, and having additional features as discussed previously. Such structure can be achieved, for example, in using fibers having relatively small denier size (for example, having a denier of one or less). It has been difficult to form fiber-containing material with fibers of such a small size, since it is very expensive to make the smaller fibers, for example, because of the cost of the die having very small holes for extrusion; and also due to small diameter fibers being

very fragile, for example, when being carded in a web-forming process or being extruded in the fiber-forming process.

Against this background, Applicants provide fiber-containing material having the desired improvement in both strength and softness simultaneously, which due thereto is self-supporting and can be used by itself, as, e.g., a web or fabric, and wherein the fiber-containing material can have a high surface area and small pore size. Applicants can utilize small fibers in the fiber-containing material.

Applicants have found that utilizing multi-component fibers including at least first and second segments respectively of specified first and second polymer materials of different melt temperatures, especially with the segments being at least partially split from each other, and with the lower melt temperature polymer material (that is, polymer material of the second segments) being melted to provide a binder of the fiber-containing material, the melted second polymer material, of the second segments, being substantially only at the cross-over points of the first segments of first polymer material of higher melt temperature, e.g., encapsulating the cross-over points, objects according to the present invention are achieved. That is, a fiber-containing material of high strength and of good softness is achieved. Such fiber-containing material is self-supporting and can be used by itself (that is, not as part of a composite) as a web or fabric. With the binding polymer material, of the second segments, being melted and being substantially only at the cross-over points of the first segments (especially, in encapsulating the cross-over points), improved strength is achieved with use of less binder. Furthermore, with the melted second polymer material substantially only at the cross-over points where the first segments cross each other, there is less binder material waste; and, moreover, softness is improved.

In addition, because more bonding sites are formed, e.g., at the cross-over points of the first segments, a more even appearance is achieved. Note, in particular, the sole full paragraph on page 24, and the paragraph bridging pages 24 and 25, of Applicants' specification. Note, also the paragraph bridging pages 8 and 9 of Applicants' specification.

In addition, the present invention uses multi-component fibers, which are subsequently split and thereafter wherein the second segments are melted and become a binder of the fiber-containing material. Through use of the multi-component fibers, during a large part of the processing in forming the fiber-containing material relatively large-size fibers, as compared with the size of the segments, are processed, so that the dies for extrusion can be relatively large (and thus relatively inexpensive), while the multi-component fibers formed are relatively sturdy and sufficiently strong for the fiber-forming and material-forming processes. Thus, a product with smaller denier fibers (i.e., the segments) can be formed, easily and relatively inexpensively.

Harrington, et al. discloses a process for producing a polypropylene non-woven fabric bonded by polyethylene. According to the described processing techniques, a non-woven material containing polypropylene can be bonded with a polyethylene fiber binder, the bonding being accomplished by the use of polyethylene fibers which have a low melt viscosity at elevated temperatures. This patent discloses that this viscosity is necessary in order to have the polyethylene flow to the intersects of the polypropylene fiber and form bonds at these intersects. See column 1, lines 57-70. Note also column 2, lines 12-17, for a description of the polypropylene which may be bonded with polyethylene fibers.

It is respectfully submitted that Harrington, et al. is concerned solely with polypropylene bonded with polyethylene fibers. It is respectfully submitted that the teachings of this reference, directed solely to a polypropylene non-woven fabric, would have neither disclosed nor would have suggested the fiber-containing material according to the present invention, wherein the first polymer material is selected from the group as in all of the present claims.

In addition, it is again noted as to the advantages achieved by the present invention using the multi-component fibers, and the material made by the processing as set forth in the present claims. It is respectfully submitted that Harrington, et al. discloses mixing of fibers. As is clear from the prior art discussion, such mixing would not provide the improved distribution and finer divisions achieved according to the present invention, as the processing, including use of the multi-component fibers, provides a different product than that of the applied prior art. It is respectfully submitted that the teachings of the applied prior art would have neither disclosed nor would have suggested the presently claimed material.

It is respectfully submitted that the additional teachings of Tortora would not have rectified the deficiencies of Harrington, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art. As applied by the Examiner, Tortora discloses ultrafine fibers. It is respectfully submitted that the teachings of Tortora, even in combination with the teachings of Harrington, et al., would have neither taught nor would have suggested the present invention, including the recited polymer materials used for the segments.

In the rejection set forth in Item 8 on pages 3-5 of the Office Action mailed April 12, 2004, the Examiner did not reject claim 29 over the combined teachings of

Harrington, et al., and Tortora. Particularly in view of incorporation of subject matter of claim 29 into each of the previously rejected independent claims, it is respectfully submitted that the rejection set forth in Item 8 on pages 3-5 of the Office Action mailed April 12, 2004, is moot.

Moreover, it is respectfully submitted that Marshall would have neither disclosed nor would have suggested the presently claimed subject matter. Marshall discloses a process for stabilizing the fiber orientation and fiber distribution in webs of textile-length fibers which are intended to be eventually processed into nonwoven fabrics. This patent discloses that the web is formed of non-thermally sensitive fibers having admixed therewith in random distribution and oriented throughout the length, breadth and depth of the web, a minor proportion of short fibers of a drawn, thermoplastic and thermoretractile nature which liquefy at a temperature below the melting point of the non-thermally sensitive fibers. The mixed fiber web is heated, at zero pressure, to a temperature sufficient to cause the drawn, thermoretractile fibers to retract and melt to a series of fluid beads with substantially complete loss of fiber identity, the beads locating principally at the crossover points of the non-thermally sensitive fibers. This patent discloses that when the web is cooled, the fluid beads solidify so as to act as a restorative force that stabilizes the relative orientation and distribution of the non-thermally sensitive fibers. Note the paragraph bridging columns 3 and 4 of this patent; see also column 4, lines 22-38.

It is emphasized that Marshall discloses that the beads locate principally at the crossover points. As is clear, for example, in Fig. 6 of this patent, many of the beads do not fall at crossover points. See also column 7, lines 16-23, of Marshall, disclosing that occasionally a bead will encircle a solitary fiber. It is respectfully

submitted that the teachings of Marshall would have neither disclosed nor would have suggested the presently claimed invention, including location of the second polymer material substantially only at the cross-over points where the first segments cross each other, and advantages of the present invention due thereto.

The contention by the Examiner that Marshall discloses a web wherein the thermosensitive fibers are melted and form beads or droplets "substantially located at the crossover points" is respectfully traversed. As indicated previously, Marshall discloses beads located "principally" at the crossover points, and in Fig. 6 clearly shows many beads not at any crossover points. Marshall, in column 7, describes that "occasionally" a bead encircles a solitary fiber, and that "a majority" of the beads bond two or more non-thermally sensitive fibers. Clearly, the teachings of Marshall would have neither disclosed nor would have suggested, and in fact would have taught away from, the present invention, including location of the second polymer material of the second segments.

Furthermore, the general teachings of Marshall with respect to the fibers of the web is noted. It is respectfully submitted that the teachings of this reference do not disclose, nor would have suggested, the presently claimed material, including the first and second polymer materials as in the present claims.

In view of the present comments and amendments, entry of the present amendments, and reconsideration and allowance of all claims presently in the application, are respectfully requested.

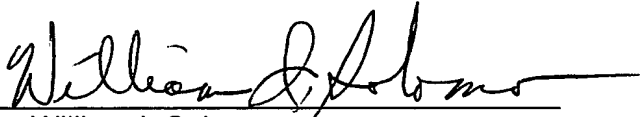
To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Antonelli, Terry, Stout & Kraus,

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Respectfully submitted,

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